

## Trend Study 16A-2-02

Study site name: Santaquin Bench.

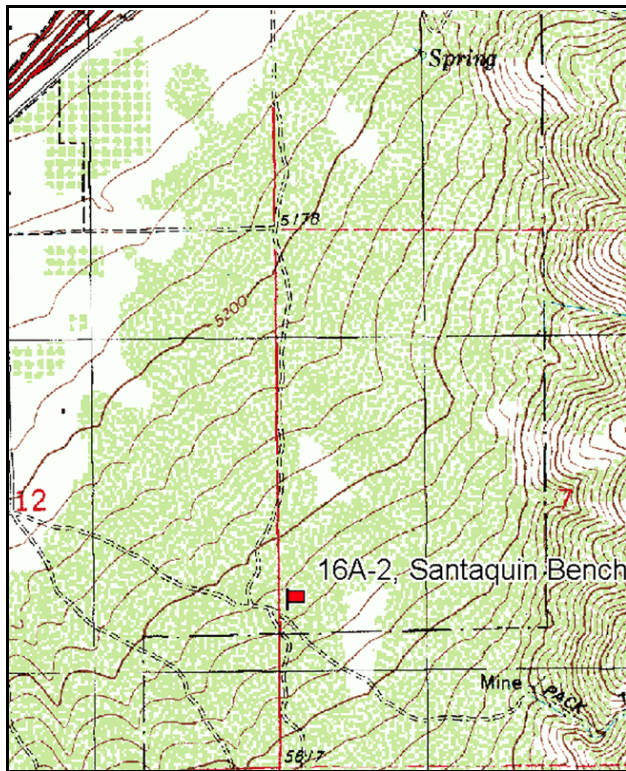
Vegetation type: Mixed Oak-Sage.

Compass bearing: frequency baseline 28 degrees magnetic (lines 2-3 @ 290°M).

Frequency belt placement: line 1 (11 & 59 & 95ft), line 2 (71ft), line 3 (34ft).

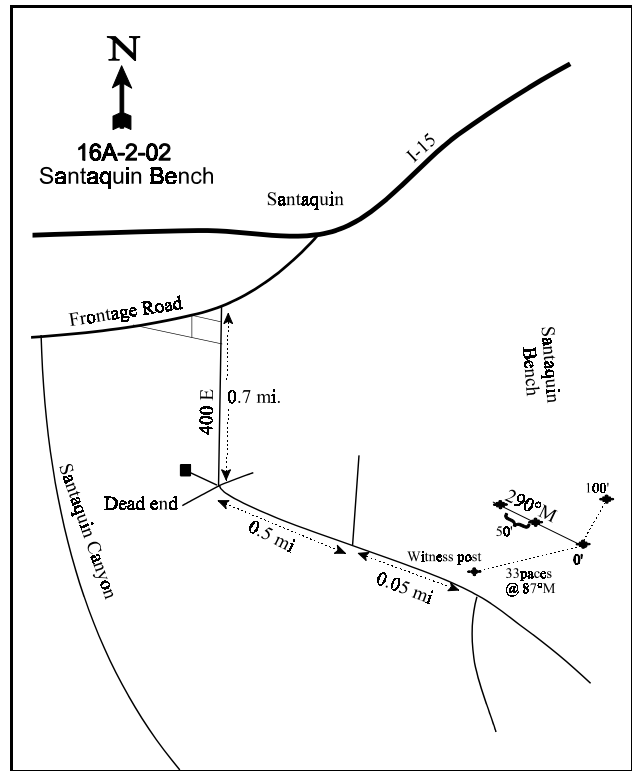
### LOCATION DESCRIPTION

From the I-15 interchange on the east side of Santaquin, proceed southwest on the frontage road (Highland Drive) for a short distance to where there are several forks. Turn left on 400 East that turns due south and passes through some orchards and home sites. Travel 0.7 miles to where the road forks at the end of a maintained road. Turn immediately to the left (east) and travel 0.50 miles to a fork in the road. Stop at the witness post on the left. The 0-foot baseline stake is located 33 paces from the witness post at an azimuth of 87°M. The study markers are green steel fenceposts approximately 12 to 18 inches in height. The 0-foot baseline stake is marked by browse tag #3929. The last baseline is only 50 feet long.



Map Name: Santaquin

Township 10S, Range 2E, Section 7



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4423177 N 434581 E

## DISCUSSION

### Santaquin Bench - Trend Study No. 16A-2

This study is located on deer and elk winter range on the Santaquin Bench within the Uinta National Forest. Physically the site is nearly level, having a slight west aspect and an elevation of approximately 5,480 feet. Closely intermixed patches of Gambel oak and mountain big sagebrush made up the dominant overstory prior to 2001. The entire area burned in 2001 as part of the Molly fire. Prior to the burn, Stansbury cliffrose, antelope bitterbrush, and Utah juniper were occasionally abundant. Surrounding oak clones were thick and appeared to be increasing leaving smaller openings for sagebrush. Deer and elk pellet groups were common in 1983, but few deer and elk pellet groups were found in 1997 and 2002. This site offered good escape and thermal cover prior to the fire but better winter range can be found on nearby west facing slopes. A pellet group transect read in 2002 sampled only 2 deer pellet groups (1 deer day use/acre, 3 ddu/ha).

Soil is derived from sedimentary alluvial deposits. Texture is described as a "cobbly loam" in the surface horizons. Surface soil is slightly acidic. The subsoil tends to be more alkaline and strongly calcareous (USDA-SCS 1972). Soil at the site is relatively deep with an effective rooting depth of almost 14 inches. Parent material is limestone. Texture is a loam with a moderately acidic pH (6.0). Large cobble can be found on the surface and throughout the profile. The soil surface is well protected by grass and litter cover in the openings and by abundant litter under the oak clones. After the fire, percent bare ground increased dramatically from 2% to 56%. However, grasses and forbs have come back relatively well and there is sufficient protective ground cover to limit severe erosion. The soil erosion condition classification was determined to be stable in 2002.

Prior to the fire, the key browse species included Gambel oak and mountain big sagebrush. Oak accounted for half of the shrub cover and formed relatively dense clumps of variable height. Overhead canopy cover of oak was estimated at 24% in 1997. Some oak forage was physically unavailable due to either excessive height and/or density. Age structure was indicative of an expanding population with many young plants, especially near the edges of the clones. Utilization was mostly light. Vigor had been depressed in the past due to "crank worm" infestations which severely defoliated the oak in 1997. Forty-one percent of the oak sampled in 1997 was impacted by these insects. All Gambel oak on the site was burned in the 2001 fire. Burned stems were left standing with abundant young shoots coming back. Density of resprouting oak was estimated at nearly 8,000 stems/acre in 2002.

Mountain big sagebrush occurred in the oak interspaces. Between 1983 and 1989, density declined by 37% from 1,266 plants/acre to only 799. Percent decadence also increased from 26% to 42%. Recruitment was limited with few seedlings and young encountered during either year. Use remained mostly light during these years so the decline was most likely due to oak competition combined with drought which occurred between 1987 and 1992. When the baseline was lengthened (sample size was increased) in 1997, the extended baseline was placed in more open areas to better sample the preferred mountain big sagebrush. As a result, density estimates were significantly larger compared to the 1983 and 1989 data. In 1997, there were about 2,540 sagebrush plants/acre which accounted for 47% of the shrub cover on the site. About 74% of the population was estimated to be mature and percent decadence declined to 16%. No seedlings were found in 1997, with only 10% of the population consisting of young plants. In addition, 70% of the decadent sagebrush sampled were classified as dying. The only other shrub found on the site in 1997 was a small number of broom snakeweed. The fire in 2001 eliminated all of the sagebrush plants and broom snakeweed. Only 1 sagebrush seedling was encountered within the shrub density strips in the 2002 sample.

This site possesses a better herbaceous understory than site #16A-1, Strawberry Highline Canal. Total grass cover was nearly 20% in 1997. Abundance and composition varied greatly between the oakbrush and the sagebrush dominated openings. Under the oak canopy, Kentucky bluegrass was perhaps the most important herbaceous plant. In contrast, it occurred rarely within the sagebrush openings. In these areas, bluebunch wheatgrass and Sandberg bluegrass dominated. Annual grasses occurred at relatively low densities. Forbs were moderately diverse with few species being abundant. Two species, annual bedstraw and peavine, accounted for 81% of the forb cover in 1997. Use of the grasses and forbs appeared light. After the fire, grasses and forbs have come back relatively well. Total herbaceous cover has declined from 36% to 15%, but the number of species sampled declined from only 34 to 30. Bluebunch wheatgrass and Kentucky bluegrass are the most abundant grasses accounting for 81% of the grass cover in 2002. Forbs are diverse but only a few species are abundant. Peavine is the most abundant perennial in 2002 accounting for 62% of the forb cover.

### 1983 APPARENT TREND ASSESSMENT

The soil appears stable. The area has very little slope and vegetative cover is adequate to prevent erosion. Vegetative condition is fair. The most disturbing possibility is the potential decline or loss of mountain big sagebrush due to encroachment of Gambel oak. Understory cover, composition, and density are poor to fair. The abundance of annual grasses poses a distinct fire hazard, especially in late summer when they have fully cured.

### 1989 TREND ASSESSMENT

The soil trend is down slightly due to an increase in percent bare ground cover and a decline in litter cover. Litter cover decreased due to less annual grass production in 1989. Density of Gambel oak increased on the density plots due to the number of young sprouts encountered. The sagebrush openings appear to becoming smaller and sagebrush on the edges are declining in vigor due to shading and competition. Sagebrush vigor is generally normal concerning growth and seed production, but there is an increased level of decadence to 42% of the population. The sagebrush still displays light hedging. The data show some increases in the herbaceous understory. Bluebunch wheatgrass increased in frequency in the sagebrush openings, while Kentucky bluegrass remains dense in association with the oakbrush. Peavine is common, otherwise forbs are rather insignificant.

#### TREND ASSESSMENT

soil - down slightly (2)

browse - down (1)

herbaceous understory - up (5)

## 1997 TREND ASSESSMENT

The soil trend has bounced back from the dry years of the late 1980's. Percent bare ground cover has declined from 7% to only 2%. Litter cover declined with some of the difference being attributed to the larger sample which includes more sagebrush openings and less oak with its associated litter. Soil trend is up slightly. The browse trend for sagebrush is currently stable. The larger sample used in 1997 is partly responsible for the change in density. Percent decadency declined from 42% to 16% and vigor is slightly improved. Recruitment is still limited. Density of oak is similar to 1983 estimates and appears stable. Trend for the herbaceous understory is up slightly due to an increase in the sum of nested frequency of perennial grasses and forbs. Kentucky bluegrass has increased significantly in nested frequency.

### TREND ASSESSMENT

soil - up slightly (4)

browse - stable (3)

herbaceous understory - up slightly (4)

## 2002 TREND ASSESSMENT

This site burned during the summer of 2001. The soil trend is down with an increase in bare ground from only 2% in 1997 to 56% in 2002. Litter cover has declined from 68% to 20%. Even with this decline in protective ground cover, erosion is still minimal and the erosion condition classification was determined to be stable in 2002. The browse trend is down due to the elimination of the preferred browse, sagebrush. Oak was also burned but it is resprouting and the density of young sprouts is currently estimated at nearly 8,000 per acre. The herbaceous understory is down but most of the species sampled in 1997 have come back. Total herbaceous cover has declined from 36% in 1997 to 15% in 2002. The most abundant grasses are still bluebunch wheatgrass and Kentucky bluegrass. Forbs are diverse but only a few species are abundant. Sum of nested frequency for perennial forbs has actually increased slightly and cover is similar to 1997 estimates (9% to 8%). Peavine is the most abundant perennial forb which currently provides 62% of the forb cover.

### TREND ASSESSMENT

soil - down (1)

browse - down due to fire (1)

herbaceous understory - down (1)

## HERBACEOUS TRENDS --

Herd unit 16A, Study no: 2

T y p e	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
G	Agropyron spicatum	a <sup>89</sup>	b <sup>126</sup>	b <sup>136</sup>	a <sup>86</sup>	35	45	48	35	6.75	2.00
G	Bromus tectorum (a)	-	-	50	56	-	-	16	27	.30	.23
G	Festuca myuros (a)	-	-	3	1	-	-	1	1	.00	.00
G	Poa bulbosa	-	-	30	21	-	-	10	9	.96	.32
G	Poa fendleriana	-	-	6	-	-	-	2	-	.18	-
G	Poa pratensis	a <sup>52</sup>	b <sup>124</sup>	c <sup>202</sup>	a <sup>71</sup>	17	43	58	27	10.03	2.16
G	Poa secunda	c <sup>167</sup>	b <sup>127</sup>	a <sup>63</sup>	a <sup>43</sup>	65	46	27	21	1.23	.43
G	Sitanion hystrix	b <sup>26</sup>	b <sup>24</sup>	a <sup>-</sup>	a <sup>-</sup>	13	10	-	-	-	-
G	Unknown grass - annual (a)	-	-	b <sup>47</sup>	a <sup>-</sup>	-	-	19	-	.39	-
Total for Annual Grasses		0	0	100	57	0	0	36	28	0.69	0.23
Total for Perennial Grasses		334	401	437	221	130	144	145	92	19.16	4.91
Total for Grasses		334	401	537	278	130	144	181	120	19.86	5.15

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'83	'89	'97	'02	'83	'89	'97	'02	'97	'02
F	<i>Alyssum alyssoides</i> (a)	-	-	46	32	-	-	19	13	.12	.09
F	<i>Allium</i> spp.	<sub>a</sub> 22	<sub>a</sub> 46	<sub>b</sub> 81	<sub>b</sub> 90	13	23	36	45	.30	.30
F	<i>Antennaria</i> spp.	-	3	2	1	-	1	1	1	.00	.00
F	<i>Arabis</i> spp.	-	-	4	-	-	-	2	-	.01	-
F	<i>Aster</i> spp.	-	-	4	-	-	-	2	-	.01	-
F	<i>Astragalus</i> spp.	-	-	6	-	-	-	3	-	.07	-
F	<i>Cirsium</i> spp.	1	2	8	6	1	1	4	3	.23	.01
F	<i>Collomia linearis</i> (a)	4	-	-	-	2	-	-	-	-	-
F	<i>Collinsia parviflora</i> (a)	-	-	<sub>a</sub> 103	<sub>b</sub> 158	-	-	41	68	.35	1.15
F	<i>Cymopterus</i> spp.	<sub>a</sub> 7	<sub>a</sub> 5	<sub>b</sub> 30	<sub>a</sub> 5	2	3	14	3	.12	.04
F	<i>Descurainia pinnata</i> (a)	-	-	3	1	-	-	1	1	.00	.00
F	<i>Draba</i> spp. (a)	-	-	<sub>b</sub> 16	<sub>a</sub> -	-	-	6	-	.03	-
F	<i>Epilobium brachycarpum</i> (a)	-	-	<sub>b</sub> 84	<sub>a</sub> 3	-	-	36	2	.30	.01
F	<i>Eriogonum racemosum</i>	<sub>ab</sub> 15	<sub>b</sub> 20	<sub>a</sub> 6	<sub>a</sub> 3	9	12	3	2	.01	.01
F	<i>Eriogonum umbellatum</i>	<sub>b</sub> 22	<sub>a</sub> 2	<sub>a</sub> 8	<sub>a</sub> -	10	2	4	-	.04	-
F	<i>Galium aparine</i> (a)	-	-	<sub>b</sub> 192	<sub>a</sub> 87	-	-	66	37	5.72	.89
F	<i>Geranium</i> spp.	-	-	2	-	-	-	1	-	.00	-
F	<i>Holosteum umbellatum</i> (a)	-	-	7	4	-	-	4	2	.02	.01
F	<i>Hymenoxys acaulis</i>	<sub>a</sub> -	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 8	-	-	-	5	-	.45
F	<i>Hydrophyllum capitatum</i>	-	1	-	-	-	1	-	-	-	-
F	<i>Lathyrus brachycalyx</i>	<sub>a</sub> 43	<sub>c</sub> 157	<sub>c</sub> 153	<sub>b</sub> 120	17	57	55	42	7.55	6.11
F	<i>Lappula occidentalis</i> (a)	-	-	-	2	-	-	-	1	-	.03
F	<i>Lactuca serriola</i>	-	-	3	1	-	-	1	1	.00	.00
F	<i>Microsteris gracilis</i> (a)	-	-	<sub>b</sub> 29	<sub>a</sub> 6	-	-	12	4	.11	.04
F	<i>Phlox longifolia</i>	<sub>a</sub> 9	<sub>ab</sub> 19	<sub>ab</sub> 25	<sub>b</sub> 25	4	9	12	15	.13	.15
F	<i>Polygonum douglasii</i> (a)	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 18	<sub>c</sub> 83	-	-	6	38	.03	.31
F	<i>Ranunculus testiculatus</i> (a)	-	-	<sub>b</sub> 56	<sub>a</sub> 38	-	-	19	17	.19	.11
F	<i>Solidago</i> spp.	<sub>a</sub> -	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 13	-	-	-	5	-	.02
F	<i>Taraxacum officinale</i>	-	-	-	-	-	-	-	-	-	.00
F	<i>Tragopogon dubius</i>	<sub>a</sub> -	<sub>ab</sub> 3	<sub>b</sub> 12	<sub>ab</sub> 7	-	2	5	3	.67	.04
F	<i>Trifolium</i> spp.	-	-	-	1	-	-	-	1	-	.00
F	Unknown forb-annual (a)	-	-	<sub>b</sub> 63	<sub>a</sub> -	-	-	28	-	.31	-
F	<i>Zigadenus paniculatus</i>	2	4	5	3	1	2	2	2	.06	.06
Total for Annual Forbs		4	0	617	414	2	0	238	183	7.21	2.66
Total for Perennial Forbs		121	262	349	283	57	113	145	128	9.25	7.25
Total for Forbs		125	262	966	697	59	113	383	311	16.46	9.92

Values with different subscript letters are significantly different at alpha = 0.10

# BROWSE TRENDS --

Herd unit 16A, Study no: 2

Type	Species	Strip Frequency		Average Cover %	
		'97	'02	'97	'02
B	Artemisia tridentata vaseyana	71	0	10.86	.01
B	Gutierrezia sarothrae	3	0	.56	-
B	Quercus gambelii	48	52	11.56	2.68
Total for Browse		122	52	22.99	2.69

# CANOPY COVER --

Herd unit 16A , Study no: 2

Species	Percent Cover	
	'97	'02
Quercus gambelii	9.6	-

# BASIC COVER --

Herd unit 16A, Study no: 2

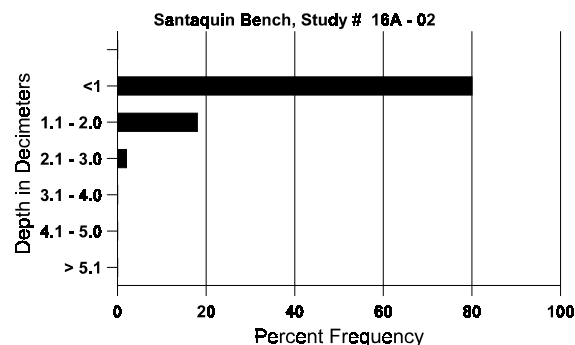
Cover Type	Nested Frequency		Average Cover %			
	'97	'02	'83	'89	'97	'02
Vegetation	385	314	1.25	3.25	54.34	18.60
Rock	74	187	2.25	3.75	3.68	4.94
Pavement	87	309	.25	2.00	1.83	12.90
Litter	398	340	91.75	81.75	67.93	19.62
Cryptogams	42	4	.25	2.25	.23	.03
Bare Ground	111	370	4.25	7.00	2.00	55.59

# SOIL ANALYSIS DATA --

Herd Unit 16A, Study no: 02, Santaquin Bench

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
13.5	46.5 (16.7)	6.0	46.4	29.1	24.6	3.9	20.2	211.2	.7

# Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 16A, Study no: 2

Type	Quadrat Frequency		Pellet Transect	
			Pellet Groups per Acre	Days Use per Acre (ha)
	'97	'02	02	02
Elk	1	1	-	-
Deer	7	2	17	1 (3)

BROWSE CHARACTERISTICS --

Herd unit 16A, Study no: 2

Artemisia tridentata vaseyana																		
S	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4		Ht.	Cr.	
83	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
		1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
		-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
		1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
Y	83	2	-	-	-	-	-	-	-	-	2	-	-	-	133		2	
		-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
		12	-	1	-	-	-	-	-	-	13	-	-	-	260		13	
		-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	83	7	4	1	-	-	-	-	-	-	12	-	-	-	800	21 21	12	
		89	6	1	-	-	-	-	-	-	7	-	-	-	466	22 28	7	
		97	64	27	3	-	-	-	-	-	94	-	-	-	1880	27 39	94	
		02	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
D	83	4	1	-	-	-	-	-	-	-	1	-	4	-	333		5	
		89	5	-	-	-	-	-	-	-	3	-	-	2	333		5	
		97	11	8	1	-	-	-	-	-	6	-	-	14	400		20	
		02	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
		89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
		97	-	-	-	-	-	-	-	-	-	-	-	-	860		43	
		02	-	-	-	-	-	-	-	-	-	-	-	-	320		16	
% Plants Showing		Moderate Use			Heavy Use			Poor Vigor			%Change							
'83		26%			05%			21%			-37%							
'89		08%			00%			17%			+69%							
'97		28%			04%			11%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	1266	Dec:	26%			
												'89	799		42%			
												'97	2540		16%			
												'02	0		0%			

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Gutierrezia sarothrae																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0	
	89	2	-	-	-	-	-	-	-	-	-	-	-	-	133	7	2	
	97	2	-	-	-	-	-	-	-	-	-	-	-	-	40	9	2	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0	
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	-	-	1	20		1		
	02	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%										
'89		00%			00%			00%			-40%							
'97		00%			00%			25%										
'02		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	0%			
												'89	133		0%			
												'97	80		25%			
												'02	0		0%			



A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Quercus gambelii																		
S	83	28	-	-	-	-	-	-	-	-	28	-	-	-	1866		28	
	89	17	-	-	4	-	-	1	-	-	13	9	-	-	1466		22	
	97	1	-	-	13	-	-	-	-	-	13	1	-	-	280		14	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	27	-	-	-	-	-	-	-	-	27	-	-	-	1800		27	
	89	121	-	-	11	-	-	-	-	-	95	37	-	-	8800		132	
	97	82	1	-	-	-	-	-	-	-	36	47	-	-	1660		83	
	02	386	-	12	-	-	-	-	-	-	395	3	-	-	7960		398	
M	83	23	2	-	4	-	-	-	16	-	45	-	-	-	3000	66 39	45	
	89	4	-	-	-	-	-	-	36	-	38	2	-	-	2666	120 39	40	
	97	157	9	4	-	-	-	-	-	-	108	62	-	-	3400	69 46	170	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0	7 9	0	
D	83	1	-	-	-	-	-	-	-	-	-	-	1	-	66		1	
	89	2	-	-	2	-	-	-	1	-	4	-	-	1	333		5	
	97	-	2	-	-	-	-	-	-	-	-	2	-	-	40		2	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	520		26	
	02	-	-	-	-	-	-	-	-	-	-	-	-	-	200		10	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		03%			00%			01%			+59%							
'89		00%			00%			.56%			-57%							
'97		05%			02%			00%			+36%							
'02		00%			03%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	4866	Dec:	1%			
												'89	11799		3%			
												'97	5100		1%			
												'02	7960		0%			